2011 GSA Annual Meeting in Minneapolis (9–12 October 2011)

Paper No. 262-28

Presentation Time: 9:00 AM-6:00 PM

3-D GEOLOGICAL MODELING OF SUBSURFACE FACIES ASSEMBLAGES CORRELATED TO THE ILLINOIAN DEGLACIATION IN EAST-CENTRAL ILLINOIS, UNITED STATES

ATKINSON, Lisa A.[1], ROSS, Martin A.[2], STUMPF, Andrew[3], and DEY, William S.[3], (1) Alberta Geology Survey, Alberta Energy Regulator, 4999-98 Avenue, Edmonton, AB T6B 2X3, Canada, lisa.atkinson@aer.ca, (2) Earth and Environmental Sciences, University of Waterloo, 200 University Ave. West, Waterloo, ON N2L 3G1, Canada, (3) Prairie Research Institute, Illinois State Geological Survey, 615 E. Peabody Dr, Champaign, IL 61820

Three-dimensional geological modeling of complex and highly-heterogeneous deposits correlated to the deglacial phase of the Illinoian glaciation was undertaken as part of a regional groundwater study in east-central Illinois. These deposits, informally referred to as the Glasford deglacial unit, form discontinuous aquifers units that are utilized for self-supplied domestic groundwater sources. These supplies can be affected by increased water usage, climate change, and extraction of groundwater from deeper, higher capacity wells.

An important challenge in this study was to model these aquifer and aquitard geometries and their internal heterogeneity. In this part of Illinois, deposits of the Illinoian glaciation, including the Glasford deglacial unit are buried in the subsurface and are not widely exposed at the land surface. Furthermore, many sediment layers are discontinuous complicating the task of modeling aquifer connectivity. The methodology employed in this study relied on the analyses of continuous cores and near-surface geophysics, which provided key controls on unit geometry and facies changes both vertically and horizontally. Using the available data, a primary database was created for the Glasford deglacial unit for inclusion of data into the 3-D model. Construction of the 3-D model was completed using gOcad® (Paradigm™), a 3-D geomodelling software. Discrete triangulated surfaces were built by interpolating standardized data points representing the top of the Glasford deglacial unit as well as key internal layers. These surfaces were then used to build a SGRID object in gOcad, which is a 3-D cellular partition that allows for mapping internal properties of stratigraphic units.

Modeling the Glasford deglacial unit was particularly important to visualize the subsurface heterogeneities that affect fluid flow in the subsurface. In addition, the derivative data from the model will be beneficial to decision-makers and regulators in managing water resources. Yet, this study highlights the difficulty in representing the complexity of highly-variable deglacial sediment assemblages at a regional scale; however, attempts to model such heterogeneities within a stratigraphic unit is important as similar complex assemblages are prevalent throughout the glaciated regions of North America.

2011 GSA Annual Meeting in Minneapolis (9–12 October 2011)
General Information for this Meeting

Session No. 262--Booth# 299
Geologic Maps, Digital Geologic Maps, and Derivatives from Geologic and Geophysical Maps (Posters)
Minneapolis Convention Center: Hall C
9:00 AM-6:00 PM, Wednesday, 12 October 2011

Geological Society of America *Abstracts with Programs*, Vol. 43, No. 5, p. 627